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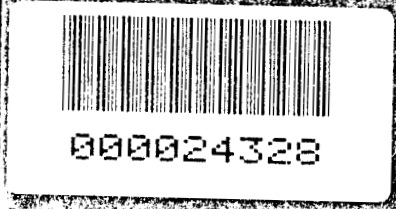
The Administrative Record Staff

JULY - 1989 EM-4180110-178

ROCKY FLATS PLANT



MONTHLY ENVIRONMENTAL MONITORING REPORT

ENVIRONMENTAL MANAGEMENT:

F. D. HOBBS, MANAGER
N. M. DAUGHERTY, HEALTH PHYSICIST
L. M. CRAIG, REPORT COORDINATOR

CONTRIBUTORS:

M. R. BOSS
A. M. LONG
C. L. SUNDBLAD
HS&E LABORATORIES
GENERAL LABORATORIES

Rockwell International
Aerospace Operations
Rocky Flats Plant
P.O. Box 464
Golden, Colorado 80402-0464

A Prime Contractor to
The United States Department of Energy

Distribution

USDOE
Albuquerque Operations Office
Health Protection Branch
P O Box 5400
Albuquerque, NM 87115

C L Soden

USDOE
Rocky Flats Plant

E S Goldberg

USEPA
One Denver Place - Suite 1300
999 - 18th Street
Denver, CO 80202-2413

Dr M Lammering

Colorado Dept of Health
4210 E Eleventh Avenue
Denver, CO 80220

D Holme A J Hazle
P Frohardt R Quillin

Division of Environmental Health
Boulder City/County Health Dept
2450 Broadway
Boulder, CO 80302

T Douville

City of Arvada
Utilities Division
8101 Ralston Road
Arvada, CO 80002

S Daniels

Colorado Water Conservation Board
823 State Centennial Building
1313 Sherman Street
Denver, CO 80203

N C Ioannides

Jefferson County Health Dept
260 South Kipling
Lakewood, CO 80226

Dr C Miller

City of Broomfield
#6 Garden Office Center
Broomfield, CO 80020

K Schnoor

Office of City Manager
City of Boulder
P O Box 791
Boulder, CO 80302

J Piper A Struthers

City of Northglenn
11701 Community Center Drive
Northglenn, CO 80234

T Ambalam

City of Westminster
4800 W 92nd Avenue
Westminster, CO 80030

W Christopher

City of Fort Collins
Office of the City Manager
300 La Porte
Fort Collins, CO 80525

S Burkett

Denver Water Department
Quality Control
1600 W 12th Avenue
Denver, CO 80254

J Dice

Air Pollution Control Spec
c/o Colorado Dept of Health
4210 E Eleventh Avenue
Denver, CO 80220

H Collier

Peak Rock Spring Water
3090 - 17th Street
Boulder, CO 80304

S Dolson

L C Holdings
11728 Hwy 93
Boulder, CO 80303

Martin Jones

Distribution

Apogee Research, Inc
4350 E West Highway, Suite 600
Bethesdsa, MD 20814

Mark Pfefferle

Frank Blaha
408 22nd Street
Golden, CO 80401

Rocky Flats Plant

M R Boss
R J Erfurdt
E R. Heintz
F D Hobbs
A M Long
C M Marsh
K B McKinley
E R Naimon
G L Potter
R. E Richardella
R. Roberts
D J Sanchini
G H Setlock
C L Sundblad
C Trice
W F Weston
J J Whicker
EMF
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Table I 1989 Plutonium and Uranium Airborne Effluent Data

Month	Plutonium (06/19/89 - 07/20/89 - JUL) Release (uCi)	Plutonium (06/19/89 - 07/20/89 - JUL) CMax (pCi/m3)	Uranium (06/19/89 - 07/20/89 - JUL) Release (uCi)	Uranium (06/19/89 - 07/20/89 - JUL) CMax (pCi/m3)
CY 1988	15 07	0 023 ± 0.0052	11.28	0 009 ± 0 0009
January	0.33	0.005 ± 0.0005	0.15	0.000 ± 0.0001
February	0.15	0.001 ± 0.0001	0.20	0.001 ± 0.0002
March	0 07	0 001 ± 0 0001	0.04	0 002 ± 0 0002
April	0 28	0 001 ± 0.0001	0 04	0 001 ± 0 0001
May	0.18	0 001 ± 0 0001	-0 03	0 001 ± 0 0001
June	0.06*	0 001 ± 0.0001*	0.06	0.001 ± 0 0002
July	0 18	0.001 ± 0 0002	0.15	0 001 ± 0 0002
August				
September				
October				
November				
December				
Year to Date	1.25	0 005 ± 0 0005	0 61	0 002 ± 0 0002

* Previously reported incomplete.

NOTE. The plutonium, uranium, americium, and beryllium measured concentrations in this report include values that are less than the corresponding calculated minimum detectable concentrations (MDC's) In some cases, the values are less than zero. This method of reporting began in January 1981 These negative values result when the measured value for the laboratory reagent blank is subtracted from an analytical result which was measured as a smaller value than the reagent blank This may happen when measuring concentrations which are very close to zero

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Table II. 1989 Tritium and Beryllium Airborne Effluent Data

Month	Tritium (06/23/89 - 07/26/89 - JUL) Release (Ci)	Tritium (06/23/89 - 07/26/89 - JUL) CMax (pCi/m3)	Beryllium (06/19/89 - 07/20/89 - JUL) Release (grams)	Beryllium (06/19/89 - 07/20/89 - JUL) CMax (ug/m3)
CY 1988	0 014	417 ± 250	0 1322	0 00041
January	0 001	97 ± 145	0 0285	0 00033
February	0.002	166 ± 120	-0.0392	-0 00005
March	0.007	389 ± 220	-0 0025	0 00000
April	0 152	14000 ± 320	-0 0031	0.00017
May	0.003	65 ± 35	0 0024	0.00004
June	0.001	99 ± 10	0.0525*	0.00025
July	0 001	108 ± 13	0.1727*	0.00106
August				
September				
October				
November				
December				
Year to Date	0.167	14000 ± 320	0 2113	0 00106

* No Blank Correction

NOTE: Beryllium measured at the remaining 44 locations was below the screening level of 0.1 gram per month

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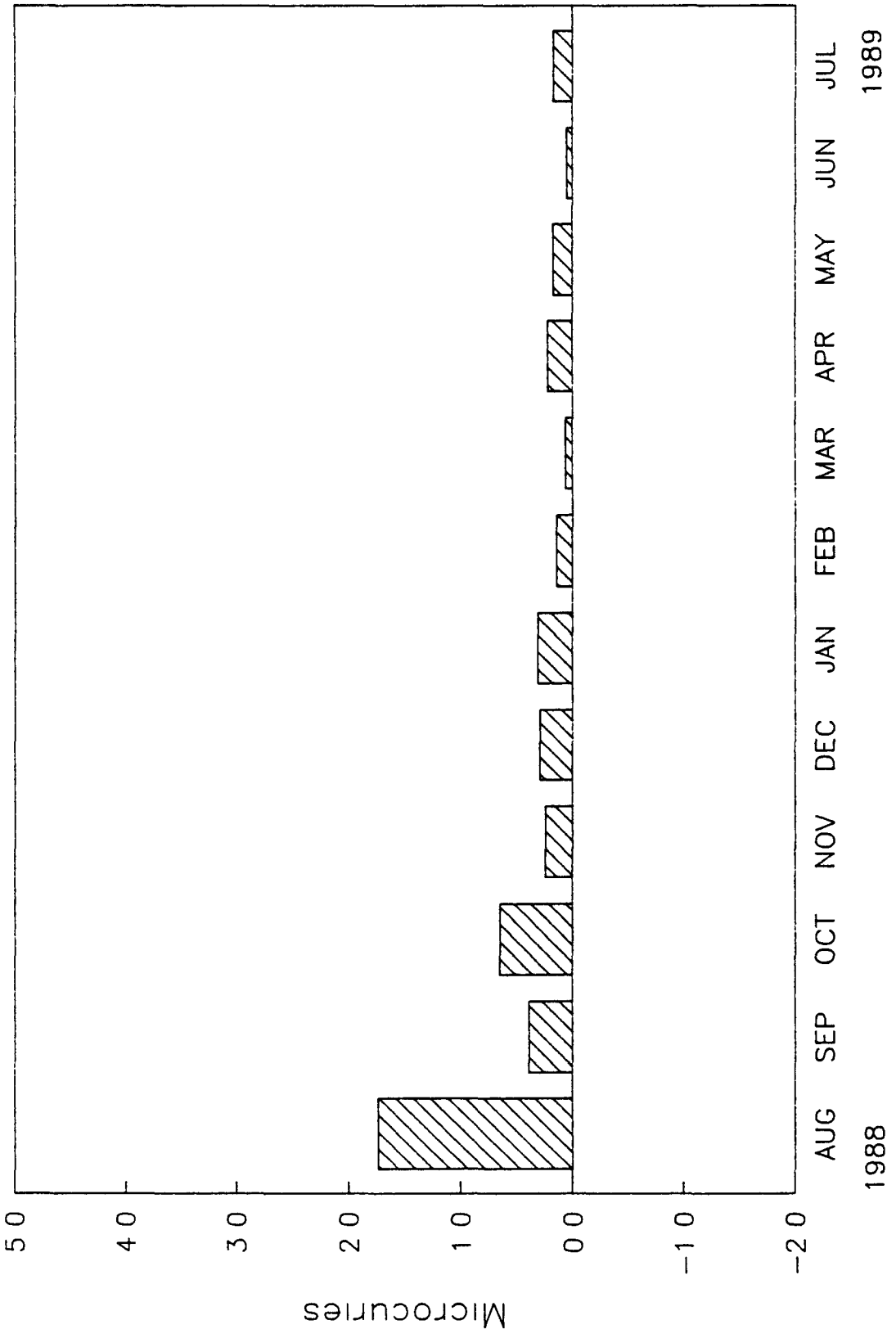
PLUTONIUM MEASURED IN EFFLUENT AIR



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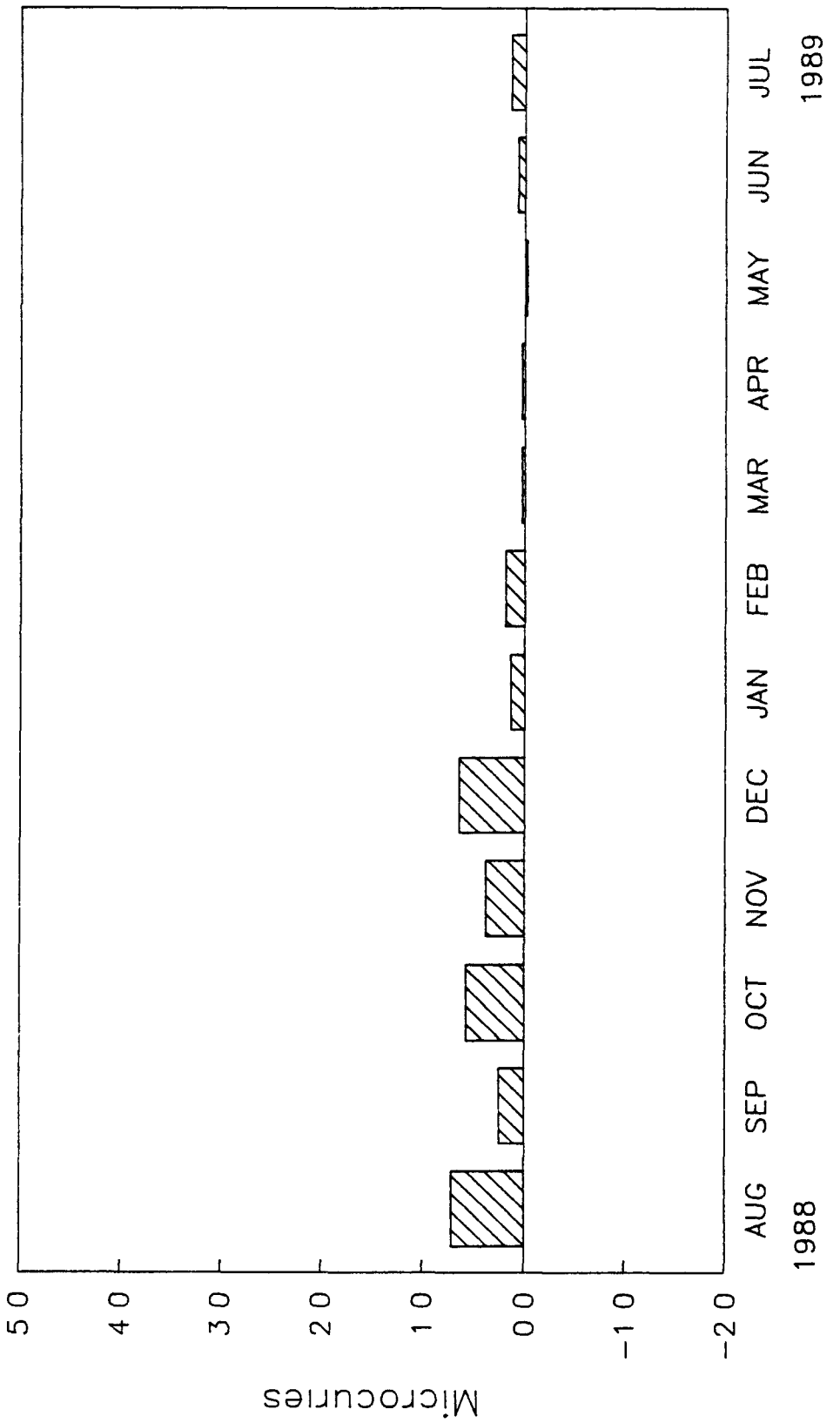
URANIUM MEASURED IN EFFLUENT AIR



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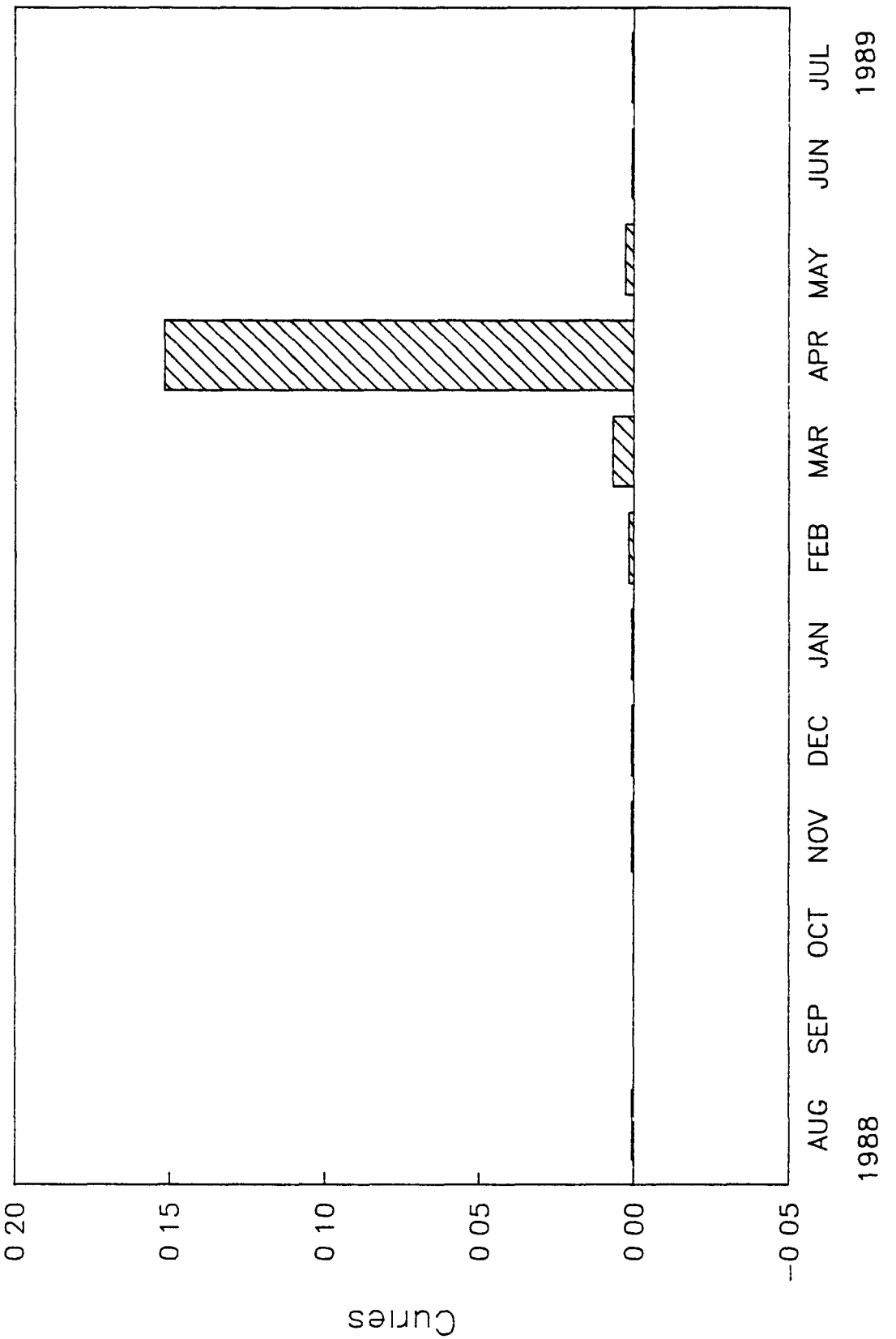
TRITIUM MEASURED IN EFFLUENT AIR



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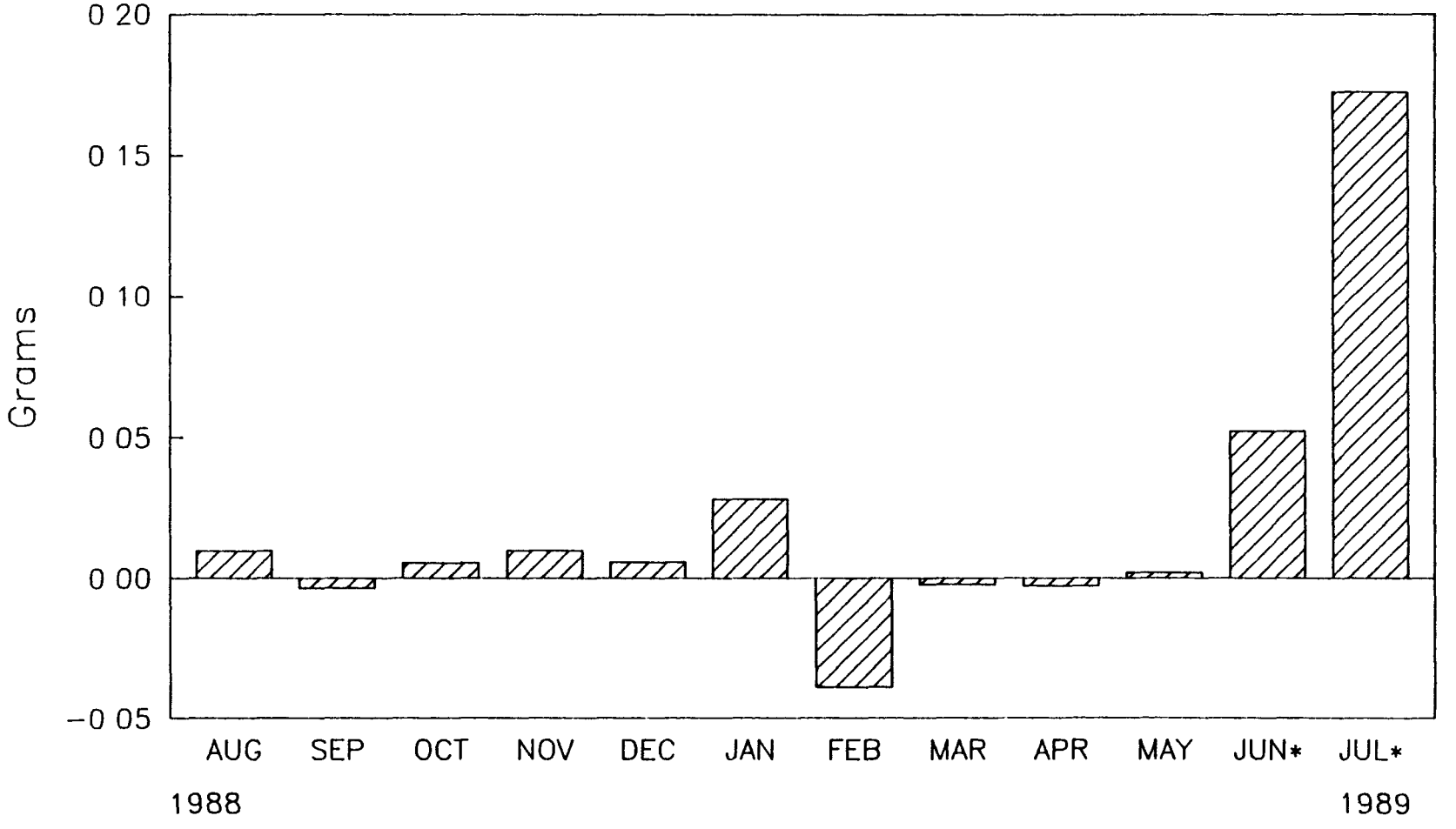
BERYLLIUM MEASURED IN EFFLUENT AIR



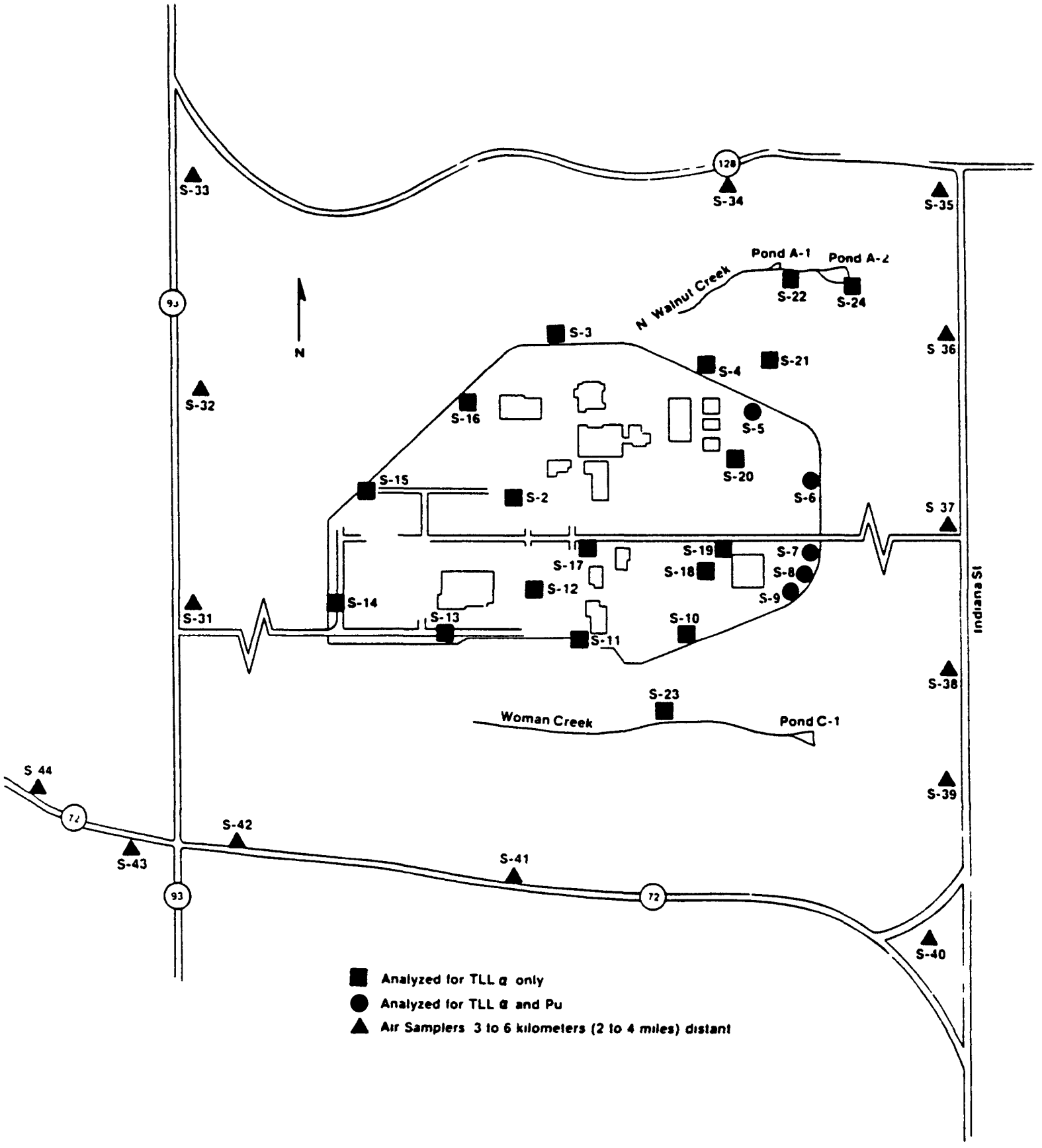
* NOT BLANK CORRECTED

Table III Plutonium at Selected Onsite Ambient Air Locations
(06/27/89 - 07/25/89)

			Concentration (pCi/m3)	
Location	n	Volume (m3)	Point Estimate	± Error
S-05	2	32000	0 000068	0 000017
S-06	2	32000	0 000095	0.000026
S-07	2	25000	0.001120	0 000231
S-08	2	31000	0 001212	0 000256
S-09	2	26000	0 001603	0 000318

NOTE: The total long-lived alpha activities of the remaining 16 onsite ambient air sampler locations were below 0.01 pCi/m^3. Plutonium-specific analyses are performed and reported if any filter from these 16 air samplers exceeds the Rocky Flats Plant screening level of 0 01 pCi/m^3 total long-lived alpha activity. Plutonium concentration data is routinely reported only for the five locations (above) which have historically produced the largest total long-lived alpha activities of the 23 onsite ambient air sampler locations

Air samplers S-02 and S-19 were inoperational during this period



Location of Onsite and Plant Perimeter Ambient Air Samplers
(Portions of figure are not to scale)

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Table IV Plutonium in Perimeter Ambient Air
(06/20/89 to 08/01/89)

Location	n	Volume (m3)	Concentration (pCi/m3) Point Estimate	± Error
S-31	1	42000	0.000001	0 000002
S-32	1	46000	0 000001	0 000002
S-33	1	47000	0 000000	0.000002
S-34	1	43000	0 000000	0.000002
S-35	1	42000	-0.000001	0.000002
S-36	1*	29000	0.000008	0 000004
S-37	1	44000	0 000001	0 000002
S-38	1	44000	0.000005	0.000003
S-39	1	46000	-0 000001	0 000002
S-40	1	41000	0.000000	0.000002
S-41	1	48000	0.000006	0 000003
S-42	1	46000	0 000000	0.000002
S-43	1	47000	0.000001	0.000002
S-44	1	45000	0 000005	0.000003

* The composite period for S-36 samples was 6/20/89 - 7/18/89. S-36 air sampler was inoperational for the remainder of July.

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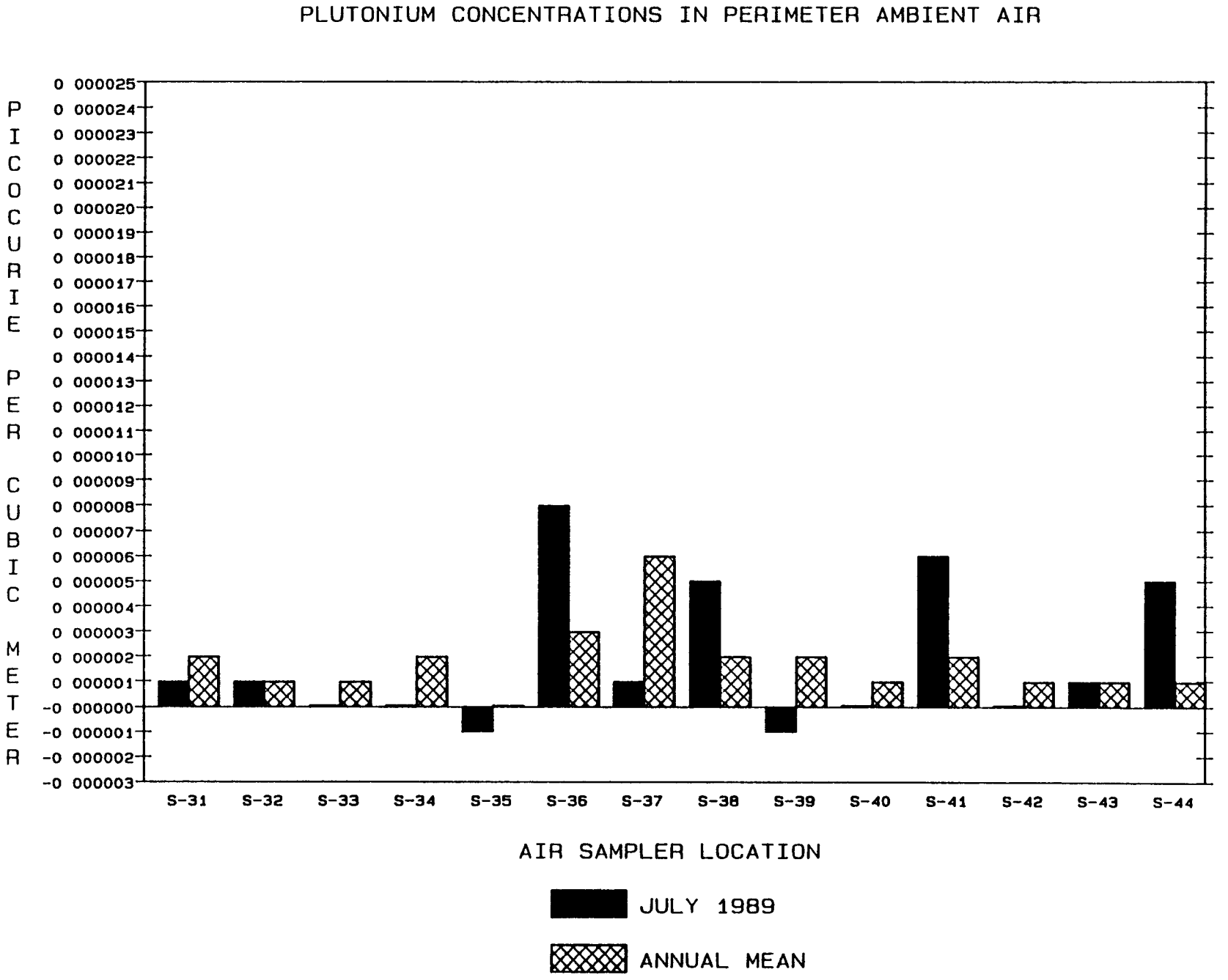
PLUTONIUM CONCENTRATIONS IN PERIMETER AMBIENT AIR
PICOCURIE PER CUBIC METER
0 000025
0 000024
0 000023
0 000022
0 000021
0 000020
0 000019
0 000018
0 000017
0 000016
0 000015
0 000014
0 000013
0 000012
0 000011
0 000010
0 000009
0 000008
0 000007
0 000006
0 000005
0 000004
0 000003
0 000002
0 000001
-0 000000
-0 000001
-0 000002
-0 000003
S-31
S-32
S-33
S-34
S-35
S-36
S-37
S-38
S-39
S-40
S-41
S-42
S-43
S-44
AIR SAMPLER LOCATION
JULY 1989
ANNUAL MEAN

JULY 1989

Table V. Plutonium in Community Ambient Air
(06/21/89 - 08/02/89)

Location	Community Name	n	Concentration (pCi/m3) Volume (m3)	Point Estimate	± Error
S-51	Marshall	1	41000	0.000001	0.000002
S-52	Jeffco Airport	1	46000	0.000000	0.000002
S-53	Superior	*	0		
S-54	Boulder	1	45000	0.000001	0.000002
S-55	Lafayette	1	48000	0.000000	0.000002
S-56	Broomfield	1	41000	0.000000	0.000002
S-57	Walnut Creek	1	43000	-0.000003	0.000002
S-58	Wagner	1	47000	0.000001	0.000002
S-59	Leyden	1	48000	0.000001	0.000002
S-60	Westminster	*	0		
S-61	Denver	1	41000	-0.000001	0.000002
S-62	Golden	1	43000	0.000000	0.000002
S-68	Lakeview Pointe	1	41000	0.000000	0.000002
S-73	Cotton Creek	*	0		

* Air sampler inoperational during this period.

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Table V. Plutonium in Community Ambient Air
(5/24/89 - 06/21/89)

			Concentration (pCi/m3)		
Location	Community Name	n	Volume (m3)	Point Estimate	± Error
S-51	Marshall	1	29000	-0.000001	0.000003
S-52	Jeffco Airport	1	32000	0.000003	0.000003
S-53	Superior	**	0		
S-54	Boulder	*	31000		
S-55	Lafayette	1	33000	0.000003	0.000003
S-56	Broomfield	1	29000	-0.000001	0.000003
S-57	Walnut Creek	1	30000	-0.000001	0.000003
S-58	Wagner	1	32000	-0.000001	0.000003
S-59	Leyden	1	33000	0.000000	0.000003
S-60	Westminster	1	22000	-0.000001	0.000004
S-61	Denver	1	28000	-0.000001	0.000003
S-62	Golden	1	31000	0.000002	0.000003
S-68	Lakeview Pointe	1	30000	0.000000	0.000003
S-73	Cotton Creek	1	22000	-0.000001	0.000004

* No plutonium analysis of S-54 sample reported due to insufficient chemical recovery of both sample aliquots.

** Air sampler was inoperational during this period.

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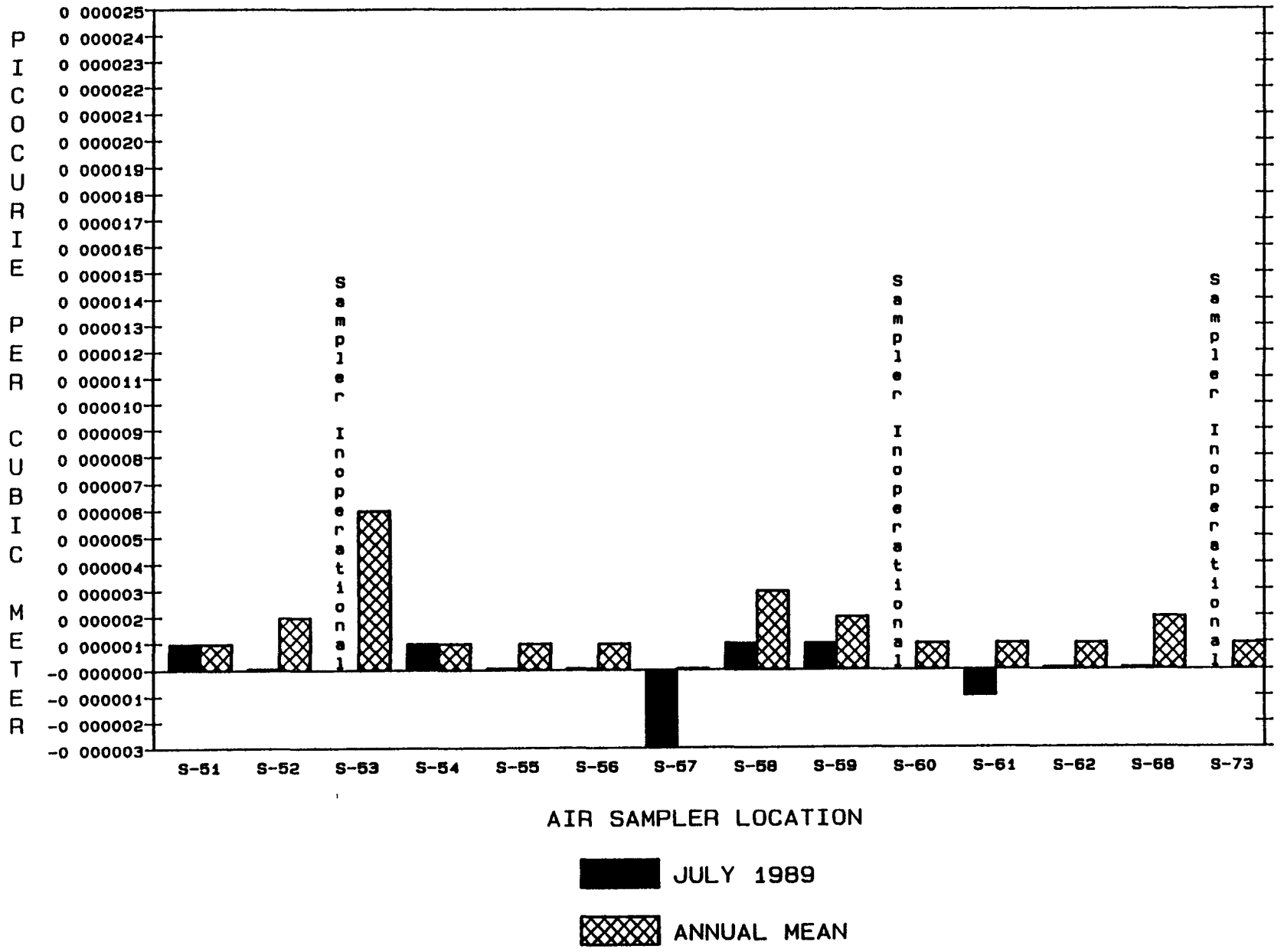
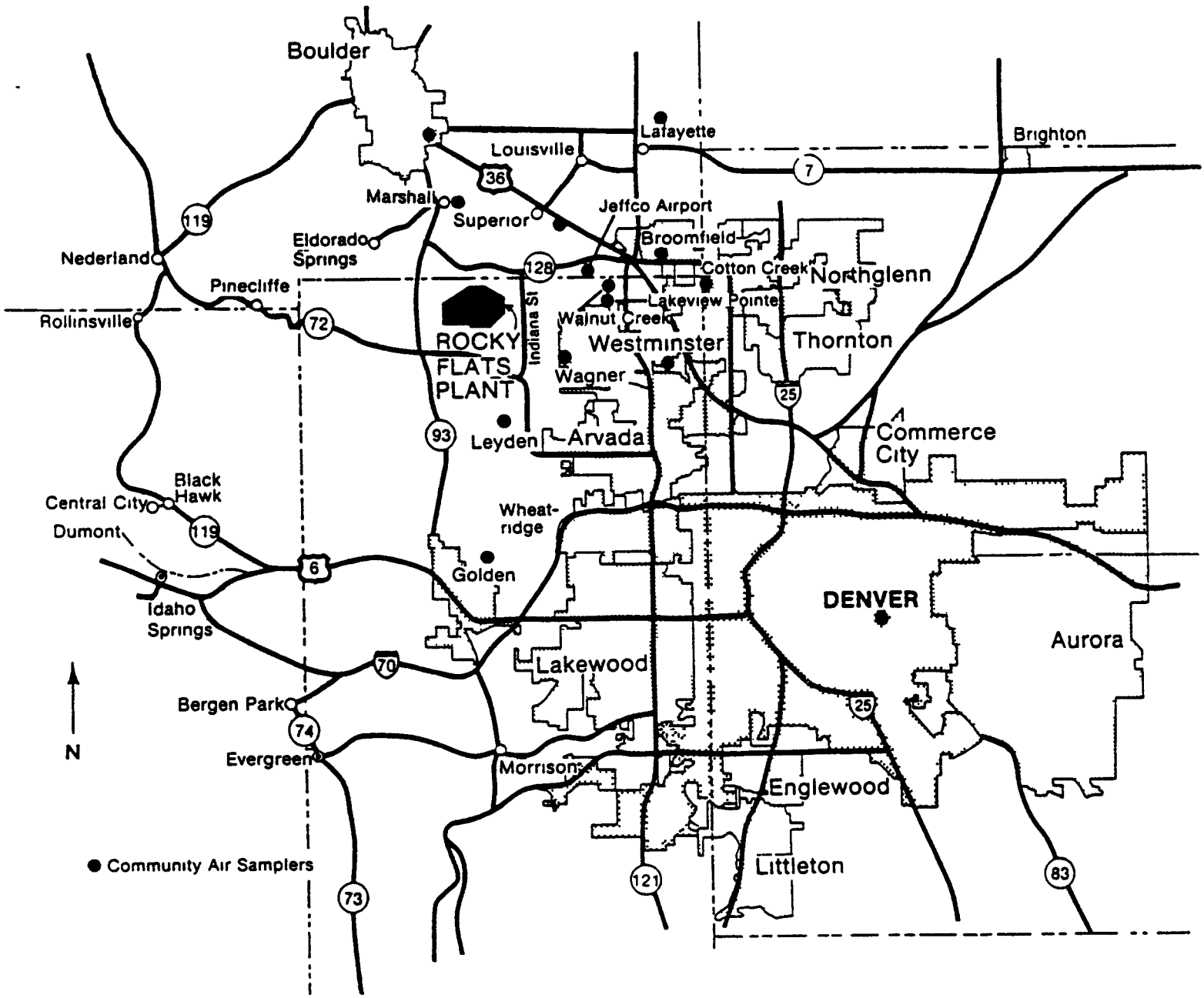
PLUTONIUM CONCENTRATIONS IN COMMUNITY AMBIENT AIR



Location of Community Ambient Air Samplers



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JULY 1989

Table VI. Onsite Water Sample Results - Plutonium, Uranium, and Americium

Holding Pond Outfall (pCi/l)

Location	Plutonium	Uranium	Americium
Pond A-4			
No Discharge			
Average Concentration			
Pond B-5			
No Discharge			
Average Concentration			
Pond C-1			
No Discharge			
Average Concentration			
Pond C-2			
No Discharge			
Average Concentration			
Walnut Creek at Indiana			
No Discharge			
Average Concentration			

* Analysis Incomplete

JUNE 1989

Table VI. Onsite Water Sample Results - Plutonium, Uranium, and Americium

Holding Pond Outfall (pCi/l)

Location	Plutonium	Uranium	Americium
Pond A-4			
No Discharge			
Average Concentration			
Pond B-5			
No Discharge			
Average Concentration			
Pond C-1			
06/05/89 to 06/09/89	0.014 ± 0.008	1.12 ± 0.19	0.075 ± 0.014
06/12/89 to 06/16/89	0.012 ± 0.007	0.82 ± 0.18	-0.001 ± 0.005
06/19/89 to 06/23/89	0 008 ± 0 006	5.00 ± 0.42	0 000 ± 0 005
06/26/89 to 06/30/89	0.000 ± 0.029*	2.22 ± 0.19	-0.002 ± 0 005
Average Concentration	0.009 ± 0.016*	2.29 ± 0.27	0.018 ± 0.008
Pond C-2			
No Discharge			
Average Concentration			
Walnut Creek at Indiana			
06/02/89	0.003 ± 0.029	4.36 ± 0.33	0.023 ± 0.025
06/05/89 to 06/07/89	0.004 ± 0.010	1.74 ± 0.21	0.009 ± 0.009
06/12/89 to 06/16/89	0.000 ± 0 006	2.90 ± 0.22	0 003 ± 0.005
06/19/89 to 06/20/89	0.021 ± 0.017	1.55 ± 0.16	0.019 ± 0.014
Average Concentration	0.007 ± 0.018	2 64 ± 0.24	0.014 ± 0.015

* Previously unreported data.

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MAY 1989

Table VI. Onsite Water Sample Results - Plutonium, Uranium, and Americium

Holding Pond Outfall (pCi/l)

Location	Plutonium	Uranium	Americium
Pond A-4			
No Discharge			
Average Concentration			
Pond B-5			
05/02/89 to 05/08/89	-0.009 ± 0.033	4.50 ± 0.35	0 000 ± 0.026
05/09/89 to 05/15/89	0.354 ± 0.082*	0.44 ± 0.17	0.016 ± 0.027
05/16/89 to 05/26/89	0.007 ± 0.022	2.24 ± 0 23	0.036 ± 0.030
Average Concentration	0.117 ± 0.053*	2.39 ± 0.26	0.017 ± 0.028
Pond C-1			
05/01/89 to 05/05/89	0.010 ± 0.007	1.49 ± 0.20	-0.002 ± 0.005
05/08/89 to 05/12/89	0.020 ± 0.008	1.64 ± 0.21	0.006 ± 0.005
05/15/89 to 05/19/89	0.005 ± 0.007	0.60 ± 0.17	0.004 ± 0.006
05/22/89 to 05/26/89	0.021 ± 0.006	1.36 ± 0.22	0 002 ± 0.005
Average Concentration	0.014 ± 0.007	1.27 ± 0.20	0 003 ± 0.005
Pond C-2			
No Discharge			
Average Concentration			
Walnut Creek at Indiana			
05/15/89 to 05/17/89	0.055 ± 0.019	6.34 ± 0.44	0.029 ± 0.016
Average Concentration	0.055 ± 0.019	6.34 ± 0.44	0.029 ± 0.016

* Previously unreported data.

This value is a mean of three separate analyses done for this time period on the original sample taken. The three values are: Pu239 #1 1 064 ± 0.136 pCi/l; #2 0.007 ± 0.029 pCi/l, #3 -0 009 ± 0.029 pCi/l. Since the #1 Run was uncharacteristically high, the sample was run twice. The #1 result was then determined to be an outlier As above, the mean of the three values will be used as the discharge value for this time period in any further calculations, i.e , annual report

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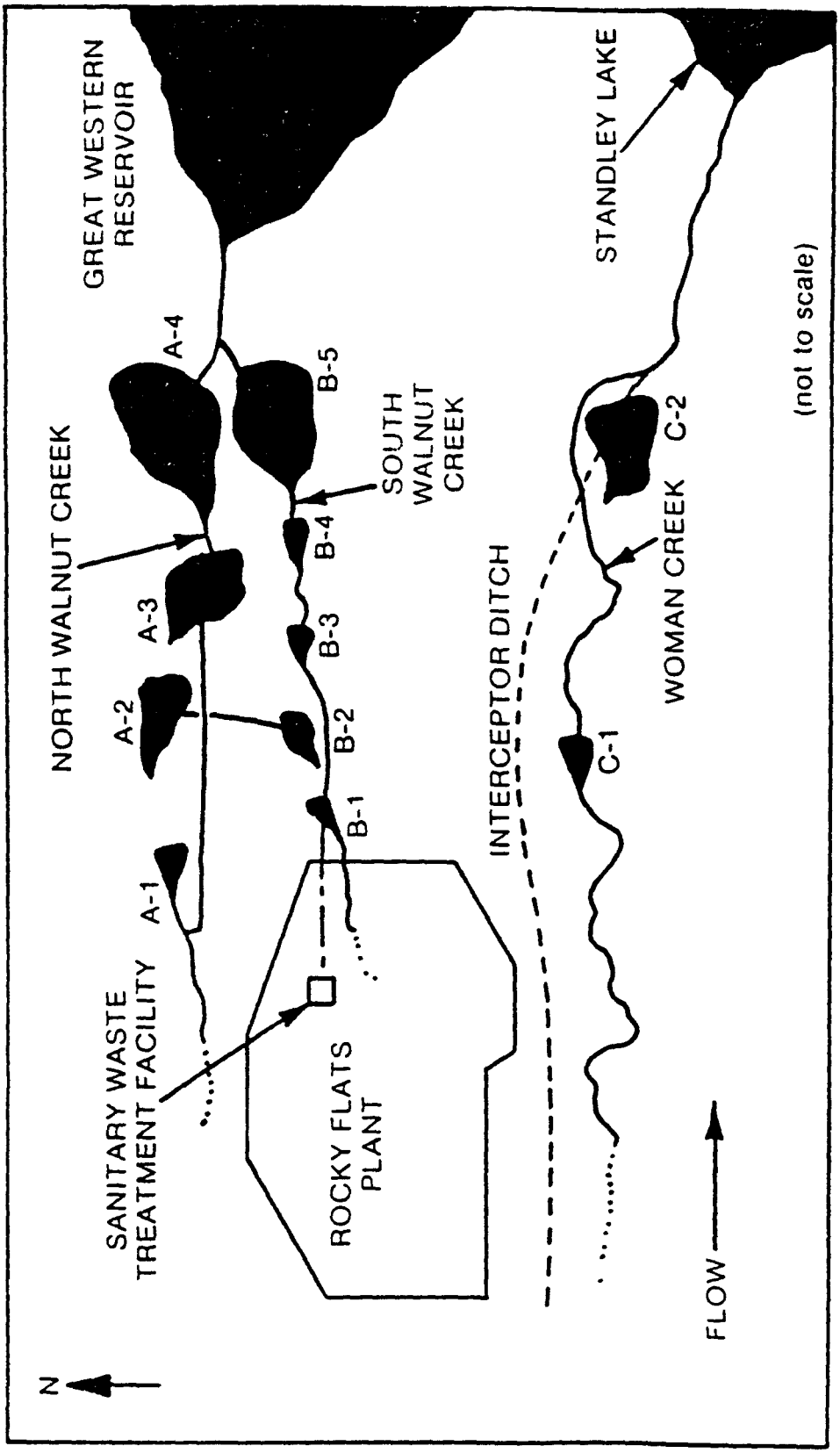

Holding Ponds and Liquid Effluent Watercourses

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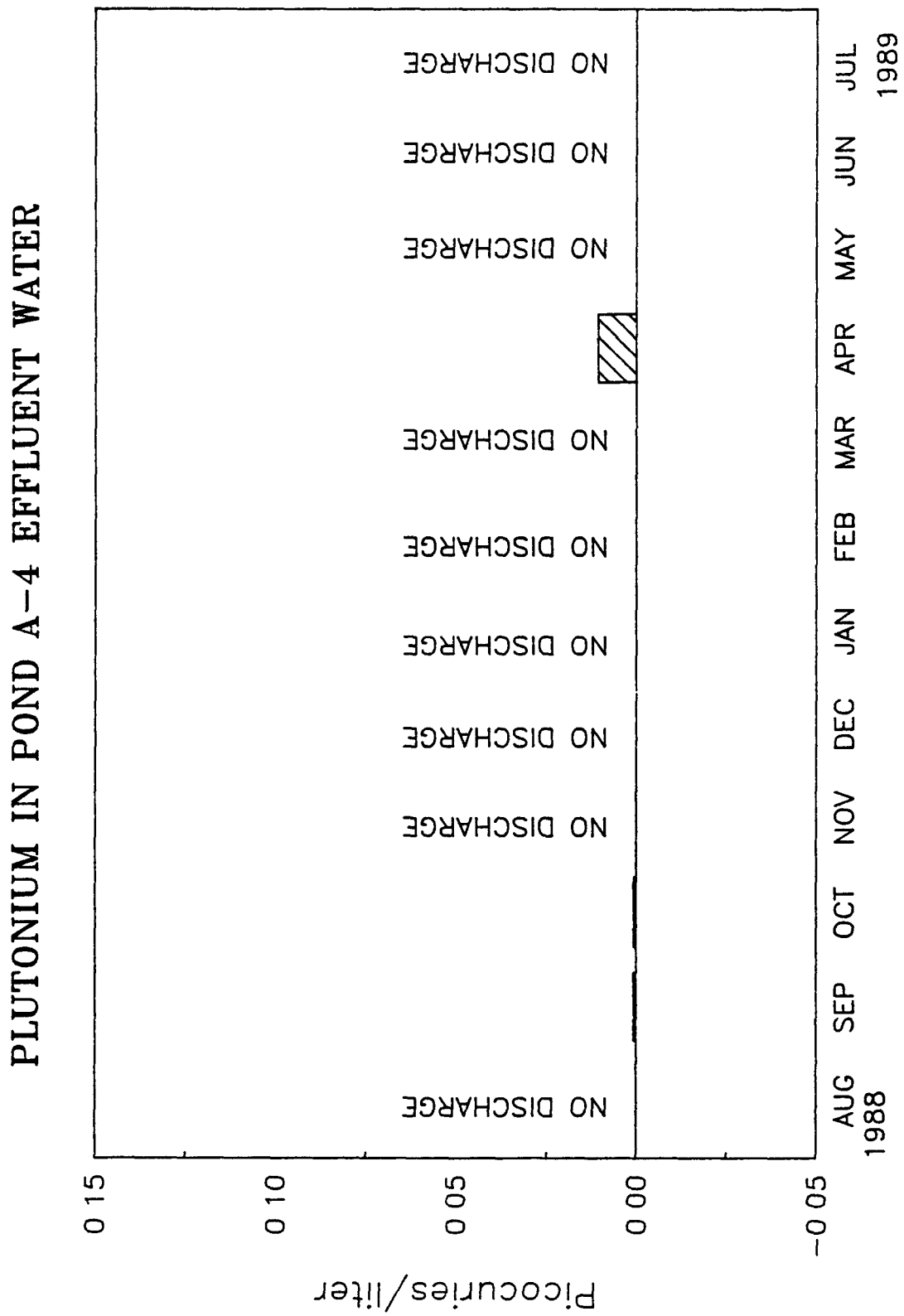
PLUTONIUM IN POND A-4 EFFLUENT WATER
Picocuries/liter
0 15
0 10
0 05
0 00
-0 05
AUG 1988
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL 1989
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE

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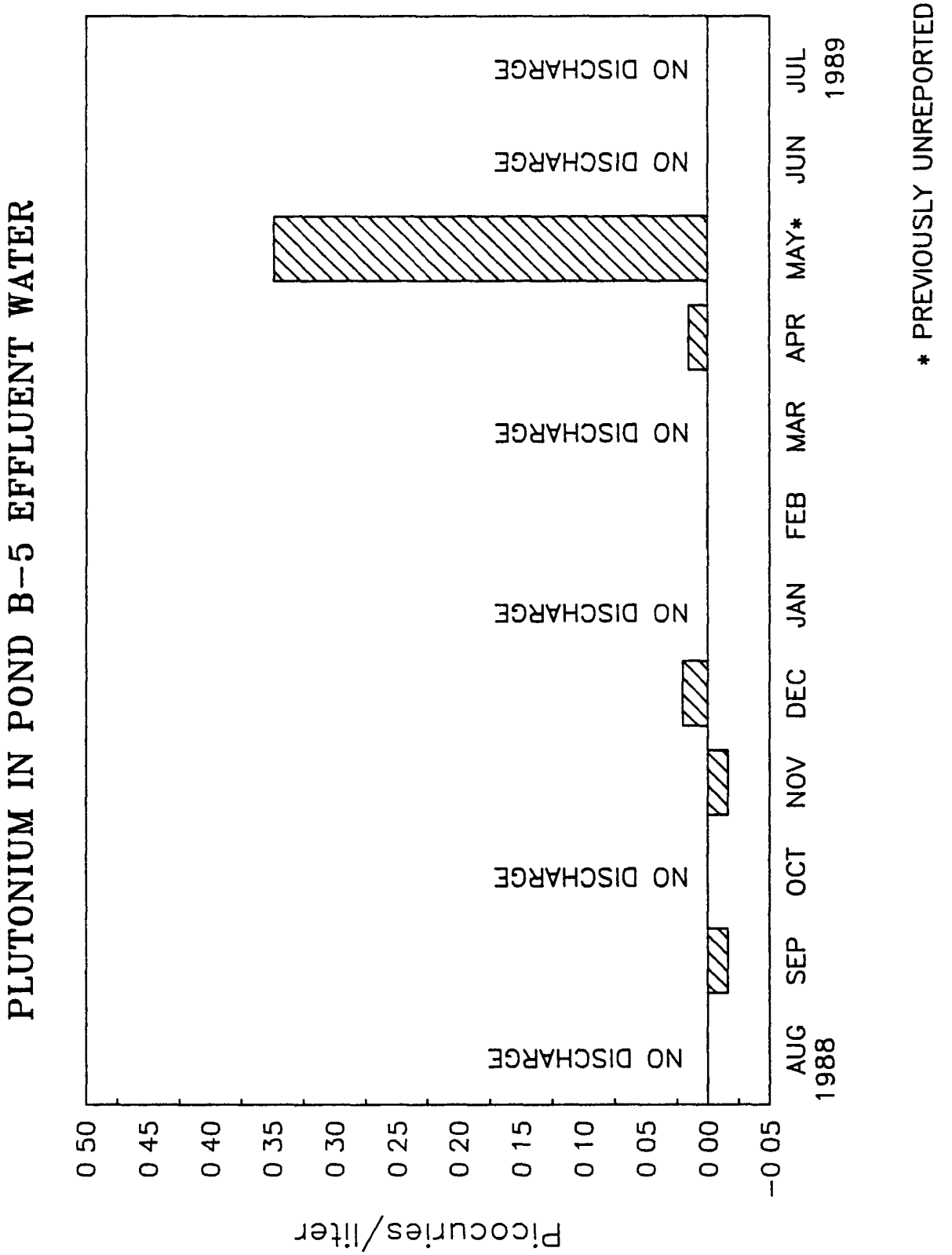
PLUTONIUM IN POND B-5 EFFLUENT WATER
Picocuries/liter
0 50
0 45
0 40
0 35
0 30
0 25
0 20
0 15
0 10
0 05
0 00
-0 05
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
AUG SEP OCT NOV DEC JAN FEB MAR APR MAY* JUN JUL
1988
1989
* PREVIOUSLY UNREPORTED DATA

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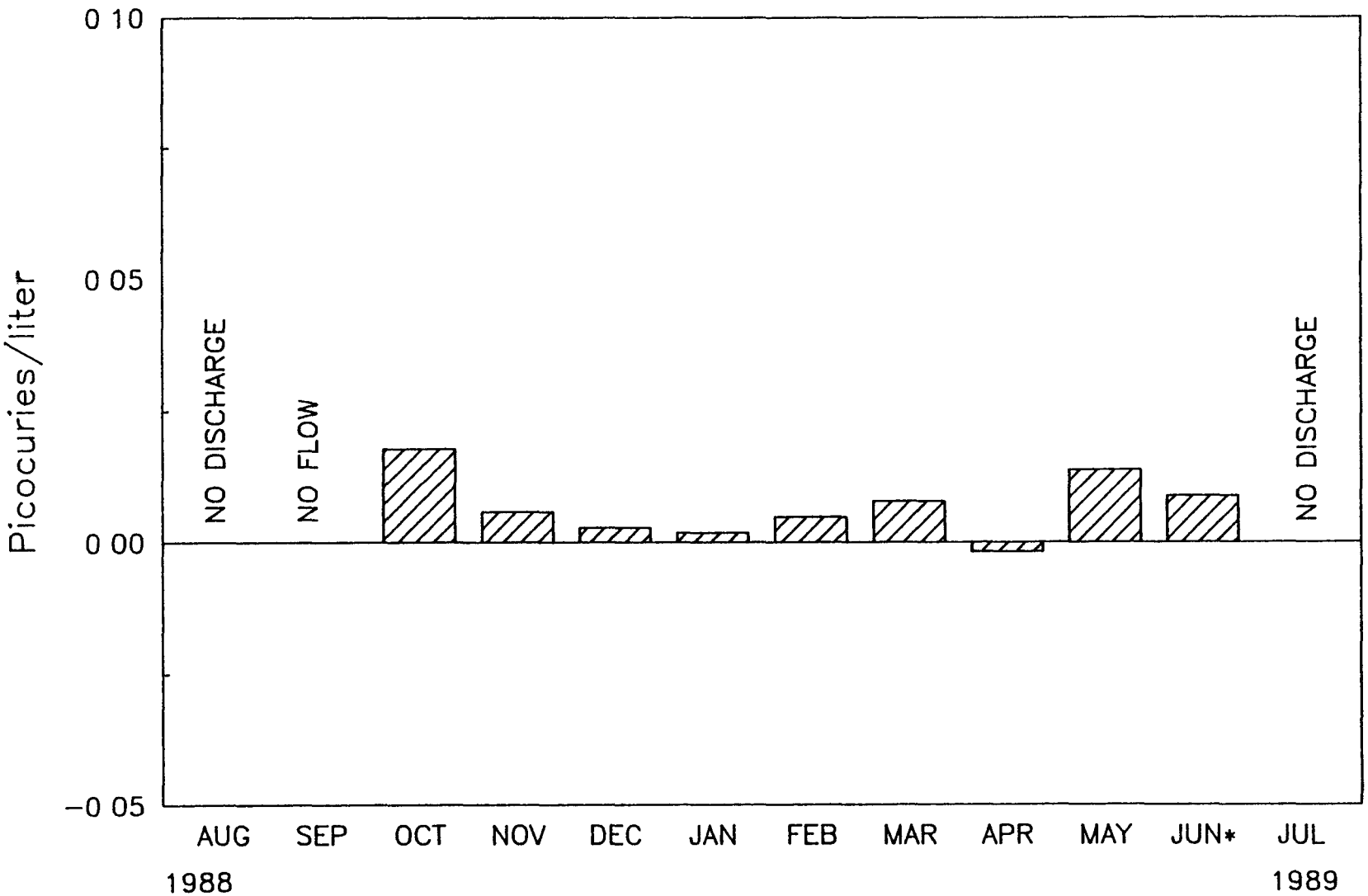
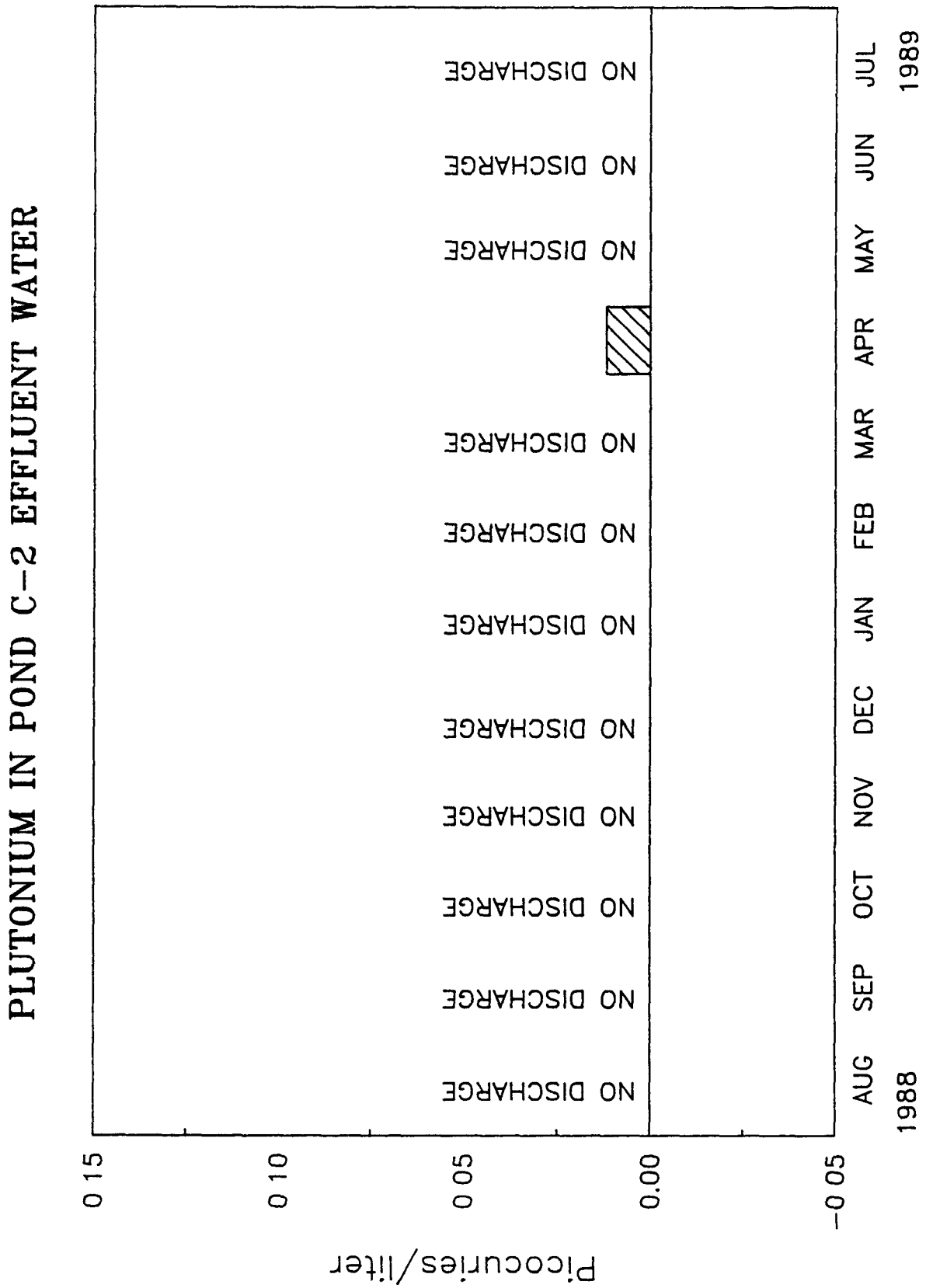
PLUTONIUM IN POND C-1 EFFLUENT WATER



* PREVIOUSLY UNREPORTED DATA


PLUTONIUM IN POND C-2 EFFLUENT WATER
Picocuries/liter
0 15
0 10
0 05
0.00
-0 05
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL
1988
1989

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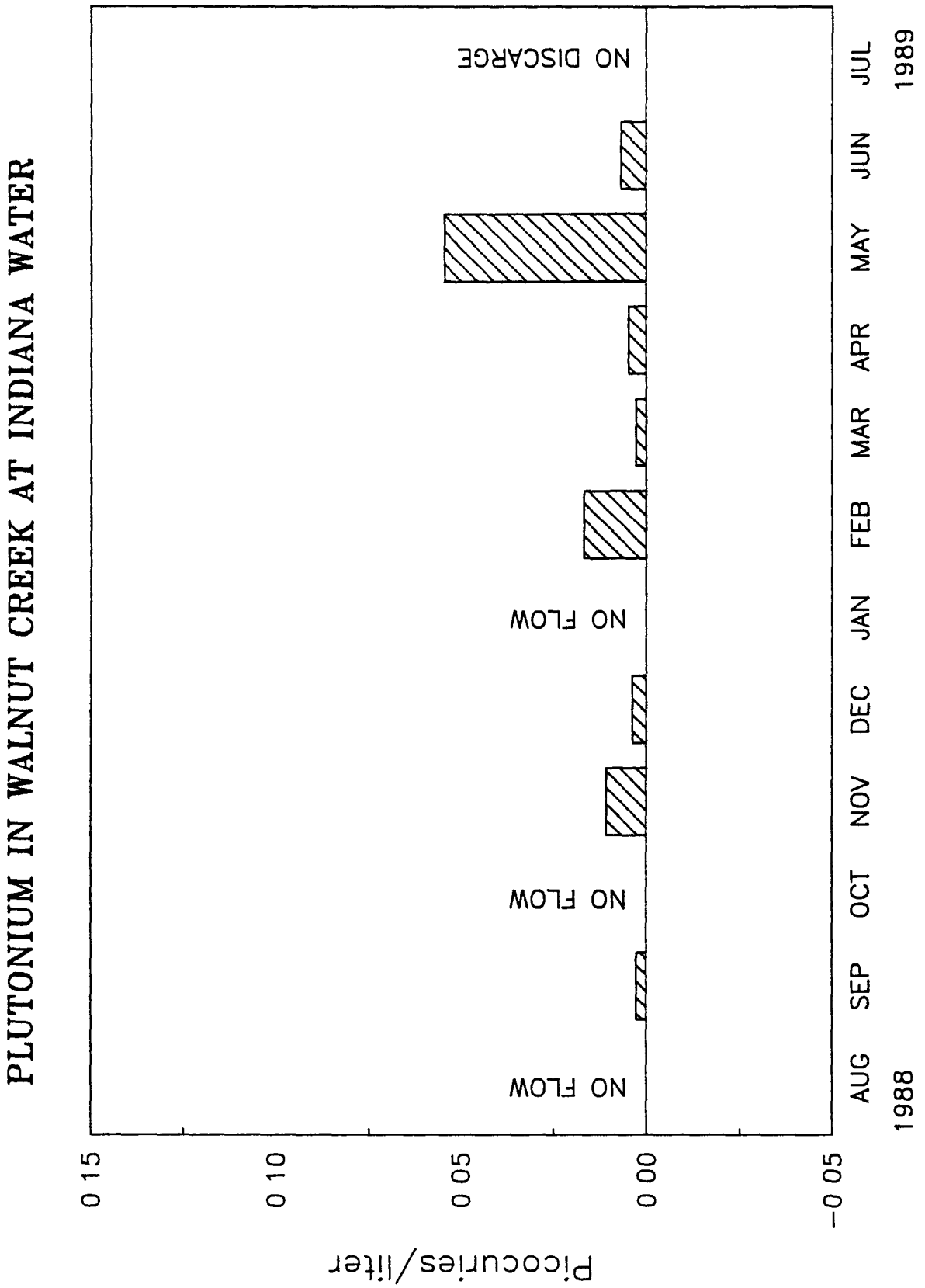
PLUTONIUM IN WALNUT CREEK AT INDIANA WATER
Picocuries/liter
0 15
0 10
0 05
0 00
-0 05
NO DISCHARGE
NO FLOW
NO FLOW
NO FLOW
AUG
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
JUN
JUL
1988
1989

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Table VII. Offsite Water Sample Results - Plutonium, Uranium, and Americium

Reservoirs (pCi/l)

Location	n	Plutonium	Uranium	Americium
Great Western	1*	0 005 ± 0.008	0.99 ± 0 13	0.000 ± 0.007
Standley Lake	1*	0.004 ± 0.008	1.43 ± 0.15	0.007 ± 0.008

Community Tap Water (pCi/l)

Location	n	Plutonium	Uranium	Americium
Boulder	1*	0.009 ± 0.008	-0.06 ± 0.08	0.007 ± 0.008
Broomfield	1*	0.004 ± 0.008	0.32 ± 0.11	-0.001 ± 0.007
Westminster	1*	0.008 ± 0.008	0.29 ± 0.09	-0.004 ± 0.007

* Plutonium, uranium and americium analyses were performed on one sample composited from four weekly grab samples.

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JUNE 1989

Table VII. Offsite Water Sample Results - Plutonium, Uranium, and Americium

Reservoirs (pCi/l)

Location	n	Plutonium	Uranium	Americium
Great Western	1*	-0.003 ± 0.006	1.54 ± 0.15	0.003 ± 0.005
Standley Lake	1*	0.000 ± 0 006	1.66 ± 0.17	-0.002 ± 0.005

Community Tap Water (pCi/l)

Location	n	Plutonium	Uranium	Americium
Arvada	1	0.031 ± 0.033	-0.08 ± 0.08**	0.026 ± 0.028
Boulder	1*	0.001 ± 0.006	-0.10 ± 0.06	0.000 ± 0.006
Broomfield	1*	-0.001 ± 0.006	0.59 ± 0.11	0.003 ± 0.005
Denver	1	-0.008 ± 0.028**	0.30 ± 0.10**	-0.011 ± 0.024**
Golden	1	0.006 ± 0.031**	0.14 ± 0.10**	-0.013 ± 0.024**
Lafayette	1	0.004 ± 0.029	-0.06 ± 0.08**	0.002 ± 0.025
Louisville	1	-0.011 ± 0.028	-0.02 ± 0.07**	0.012 ± 0.027
Thornton	1	0.008 ± 0.031**	1.45 ± 0.14**	0.011 ± 0.027**
Westminster	1*	-0.001 ± 0.006	0.69 ± 0.11	0.002 ± 0.005

* Plutonium, uranium and americium analyses were performed on one sample composited from four weekly grab samples.

** Previously unreported data.

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Table VIII Onsite and Offsite Water Sample Results - Tritium

Tritium (pCi/l)

Location	n	^{C}Minimum	^{C}Maximum	^{C}Average
Boulder	4	- 40 ± 290	30 ± 420	- 10 ± 360
Broomfield	4	-120 ± 290	170 ± 290	- 20 ± 350
Golden *	1	-120 ± 330	-120 ± 330	-120 ± 330
Great Western	4	-440 ± 400	150 ± 290	-110 ± 320
Standley	4	-110 ± 400	120 ± 290	- 20 ± 350
Westminster	4	-140 ± 290	80 ± 420	10 ± 360

* Value reported incorrectly last month.
Reported incorrect value was 120 ± 330.
Correct value shown above.

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Table IX. Offsite Water Sample Results - Nitrate as Nitrogen

Nitrate (as N) at Great Western Reservoir

Sample Date	Nitrate (as N) (mg/l)
07/10/89	0.04
07/20/89	0.07
07/27/89	0.07

Nitrate (as N) at Standley Lake

Sample Date	Nitrate (as N) (mg/l)
07/10/89	0.23
07/20/89	0.24
07/27/89	0.22

NOTE: For some nonradioactive parameters, the concentrations that are measured at or below the minimum detectable concentration (MDC) are assigned to MDC. The less than symbol (<) indicates MDC values and calculated values that include one or more MDC's.

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Table X. NPDES Permit Water Sample Results

Discharge 001 (Pond B-3)
No Discharge

Parameters		Measured 30-Day Average	Limits 30-Day* Average	Measured Daily Maximum	Limits Daily Maximum
Biochem Oxygen Demand, 5 Day	mg/l	No Discharge	10	No Discharge	25
Total Suspended Solids	mg/l		30		NA
Nitrates as N	mg/l		10		NA
Total Chromium	mg/l		0.05		0.1
Total Phosphorus	mg/l		8		NA
Oil and Grease, Visual			NA		NA
Total Residual Chlorine	mg/l		NA		0.5
Fecal Coliforms	#/100 ml		200		NA

Parameter		Measured Daily Minimum	Limits Daily Minimum	Measured Daily Maximum	Limits Daily Maximum
pH	S.U.	No Discharge	6.0	No Discharge	9.0

Discharge 002 (Pond A-3)
Four days of discharge

Parameters		Measured 30-Day Average	Limits 30-Day* Average	Measured Daily Maximum	Limits Daily Maximum
Nitrates as N	mg/l	2.57	10	2.81	20

		Measured Daily Minimum	Limits Daily Minimum	Measured Daily Maximum	Limits Daily Maximum
pH	S.U.	7.0	6.0	7.6	9.0

Discharge 003 (RO Pilot Plant)
No Discharge

Parameter		Measured Daily Minimum	Limits Daily Minimum	Measured Daily Maximum	Limits Daily Maximum
pH	S.U	No Discharge	6.0	No Discharge	9 0

* This limitation applies when a minimum of 3 consecutive samples are taken during separate weeks.

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Table X. NPDES Permit Water Sample Results (Continued)

Discharge 004 (RO Plant)
No Discharge

Parameters		Measured 30-Day Average	Limits 30-Day* Average	Measured Daily Maximum	Limits Daily Maximum
Total Suspended Solids	mg/l	No Discharge	15	No Discharge	25
Total Organic Compounds	mg/l		22		30
Total Phosphorus	mg/l		8		12
Nitrates as N	mg/l		10		20
Total Chromium	mg/l		0.05		0.1
Total Residual Chlorine	mg/l		NA		0 5
		7-Day Average	7-Day Average	30-Day Average	30-Day Average
Fecal Coliform	#/100 ml	No Discharge	400	No Discharge	200
		Daily Minimum	Daily Minimum	Daily Maximum	Daily Maximum
pH	S.U.	No Discharge	6.0	No Discharge	9.0

Discharge 005 (Pond A-4)
No Discharge

Parameters		n	C Minimum	C Maximum	C Average
pH	S.U.	No Discharge			
Nitrates as N	mg/l				
Nonvolatile Suspended Solids	mg/l				

Discharge 006 (Pond B-5)
No Discharge

Parameters		n	C Minimum	C Maximum	C Average
pH	S.U.	No Discharge			
Nitrates as N	mg/l				
Nonvolatile Suspended Solids	mg/l				

Discharge 007 (Pond C-2)
No Discharge

Parameters		n	C Minimum	C Maximum	C Average
pH	S.U.	No Discharge			
Nitrates as N	mg/l				
Nonvolatile Suspended Solids	mg/l				

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Table XI. Water Sample Results, Nonradioactive Parameters

Walnut Creek at Indiana Street
No Flow - No Discharge

Parameters		n	$C_{Minimum}$	$C_{Maximum}$	$C_{Average}$
pH	S.U.	No Flow - No Discharge			
Nitrates as N	mg/l				

Total Volume (gallons) = No Flow - No Discharge

Table XII.
Daily Flow Data Recorded at the
Walnut Creek at Indiana Gaging Station
Ponds A-4 and B-5,
July, 1989

DATE	WALNUT CREEK AT INDIANA (gallons)	POND A-4 (gallons)	POND B-5** (gallons)
07/03/89	No Flow	No Discharge	No Discharge
07/04/89	" "	" "	" "
07/05/89	" "	" "	" "
07/06/89	" "	" "	" "
07/07/89	" "	" "	" "
07/10/89	" "	" "	" "
07/11/89	" "	" "	" "
07/12/89	" "	" "	" "
07/13/89	" "	" "	" "
07/14/89	" "	" "	" "
07/17/89	" "	" "	" "
07/18/89	" "	" "	" "
07/19/89	" "	" "	" "
07/20/89	" "	" "	" "
07/21/89	" "	" "	" "
07/24/89	" "	" "	" "
07/25/89	" "	" "	" "
07/26/89	" "	" "	" "
07/27/89	" "	" "	" "
07/28/89	" "	" "	" "
07/30/89	" "	" "	" "
07/31/89	" "	" "	" "
TOTAL VOLUME	No Flow	No Discharge	No Discharge

Table XIII.
Daily Flow Data Recorded at
Ponds C-1 and C-2 During
JULY, 1989

(WOMAN CREEK)

DATE	POND C-1 (gallons)	POND C-2 (gallons)
07/03/89	No Flow	No Discharge
07/04/89	" "	" "
07/05/89	" "	" "
07/06/89	" "	" "
07/07/89	" "	" "
07/10/89	" "	" "
07/11/89	" "	" "
07/12/89	" "	" "
07/13/89	" "	" "
07/14/89	" "	" "
07/17/89	" "	" "
07/18/89	" "	" "
07/19/89	" "	" "
07/20/89	" "	" "
07/21/89	" "	" "
07/24/89	" "	" "
07/25/89	" "	" "
07/26/89	" "	" "
07/27/89	" "	" "
07/28/89	" "	" "
07/30/89	" "	" "
07/31/89	" "	" "
TOTAL VOLUME	No Flow	No Discharge

** Flow meter operation in process of evaluation.

Appendix

RADIATION STANDARDS FOR PROTECTION OF THE PUBLIC

Introduction

The primary standards for protection of the public from radiation are based on radiation dose Radiation dose is a means of quantifying the biological damage or risk of ionizing radiation. The unit of radiation dose is the rem or the millirem (1 rem = 1,000 mrem). Radiation protection standards for the public are annual standards, based on the projected radiation dose from a year's exposure to or intake of radioactive materials

Radiation dose is a calculated value. It is calculated by multiplying radioactivity concentrations in air and water or on contaminated surfaces by assumed intake rates (for internal exposures) or exposure times (for external exposure to penetrating radiation), then by the appropriate radiation dose conversion factors. That is:

RADIATION DOSE =
(RADIOACTIVITY CONCENTRATION) X
(INTAKE RATE/EXPOSURE TIME) X
(DOSE CONVERSION FACTOR)

The radioactivity concentrations can be determined either by measurements in the environment or by calculations using computer models These computer models perform airborne dispersion/dose modeling of measured building radioactivity effluents and estimated diffuse source term emissions (e g , from resuspension from contaminated soil areas).

The assumed intake rates and dose conversion factors used are based on recommendations of national and international radiation protection advisory organizations, such as the National Council of Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP)

The radioactive materials of importance in calculating radiation dose to the public from Rocky Flats Plant activities include plutonium, uranium, americium, and tritium. The alpha radiation emissions from the plutonium, uranium, and americium are the primary contributors to the projected radiation dose.

Potential public radiation dose commitments, which could have resulted from Plant operations and from background (i e , non-Plant) contributions, are calculated from average radionuclide concentrations measured at the Department of Energy (DOE) property boundary and in surrounding communities Inhalation and water ingestion are the principal potential pathways of human exposure

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Calculation of Potential Plant Contribution to Public Radiation Dose

Pending final revision of its DOE Order for radiation protection standards for the public, DOE adopted an interim radiation protection standard for DOE environmental activities to be implemented in CY1985 (Va85). This interim standard incorporates guidance from the National Council on Radiation Protection and Measurements (NCRP), as well as the Environmental Protection Agency Clean Air Act air emission standards (as implemented in 40 CFR 61, Subpart H). Included in the interim standard is a revision of the dose limits for members of the public. Tables of radiation dose conversion factors currently used for calculating dose from intakes of radioactive materials were issued in July 1988 (US88a, US88b) The dose factors are based on the International Commission on Radiological Protection (ICRP) Publications 30 and 48 methodology and biological models for radiation dosimetry. The DOE interim standard and the dose conversion factor tables are used for assessment of any potential Rocky Flats Plant contribution to public radiation dose. The DOE radiation standards for protection of the public are given below·

DOE RADIATION PROTECTION STANDARDS FOR THE PUBLIC

ICRP-, NCRP- RECOMMENDED STANDARDS FOR ALL PATHWAYS·

OCCASIONAL EXPOSURES -	500 mrem/year EFFECTIVE DOSE EQUIVALENT*
PROLONGED EXPOSURES - (>5 YEARS)	100 mrem/year EFFECTIVE DOSE EQUIVALENT
INDIVIDUAL ORGAN -	5,000 mrem/year DOSE EQUIVALENT

EPA CLEAN AIR ACT STANDARDS FOR THE AIR PATHWAY ONLY:

WHOLE BODY -	25 mrem/year DOSE EQUIVALENT
ANY ORGAN -	75 mrem/year DOSE EQUIVALENT

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Secondary radioactivity concentration guides can be calculated from the primary radiation dose standards and used as comparison values for measured radioactivity concentrations DOE provided guidance for calculating these concentration guides - called "Derived Concentration Guides" - in a 1985 memorandum to its facilities (St85). Derived Concentration Guides (DCGs) are the concentrations which would result in an effective dose equivalent of 100 mrem from one year's chronic exposure or intake In calculating air inhalation DCGs, DOE assumes that the exposed individual inhales 8,400 cubic meters of air at the calculated DCG during the year Ingestion DCGs assume a water intake of 730 liters at the calculated DCG for the year The following table lists the air and water DCGs for the principal radionuclides of interest at the Rocky Flats Plant.

To determine compliance with the EPA air emissions standards, measured airborne effluent radioactivity emissions and estimated radioactivity resuspension from soil are entered into the EPA-approved atmospheric dispersion/dose calculation computer model, AIRDOS-EPA, for calculation of the maximum radiation dose that an individual in the public could receive from the air pathway only.

For comparison with the annual radiation dose standards for protection of the public, the maximum annual effective dose equivalent that a member of the public could receive as a result of Rocky Flats Plant activities is typically less than 1 mrem, or less than 1percent of the recommended annual standard for all pathways

DOE DERIVED CONCENTRATION GUIDES FOR RADIONUCLIDES OF INTEREST AT THE ROCKY FLATS PLANT

AIR INHALATION:

Radionuclide	DCG (pCi/m^3)
Pu-239, -240	0.02

WATER INGESTION:

Radionuclide	DCG (pCi/l)
Pu-239, -240	30
Am-241	30
U-233, -234, -238	500
H-3	2,000,000

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References

US88a DOE/EH-0070, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public," U S Dept of Energy, Asst Secretary for Environment, Safety and Health, Office of Environmental Guidance and Compliance, July 1988

US88b DOE/EH-0071, "Internal Dose Conversion Factors for Calculation of Dose to the Public," U S Dept. of Energy, Asst. Secretary for Environment, Safety and Health, July 1988

Va85 Vaughan, W. A , Asst Secretary, "Radiation Standards for Protection of the Public in the Vicinity of DOE Facilities," DOE memorandum from Environment, Safety and Health, August 5, 1985

St86 Stern, R J , Director, "Preparation of Annual Site Environmental Reports for Calendar Year 1985," DOE memorandum, Office of Environmental Guidance, February 28, 1986.

**NOTE:* "Dose equivalent" is a calculated value used to quantify radiation dose; it reflects the degree of biological effect from ionizing radiation. Differences in the biological effect of different types of ionizing radiation (e g , alpha, beta, gamma, or x-rays) are accounted for in the calculation of dose equivalent

"Effective dose equivalent" is a calculated value used to allow comparisons of total health risk (based primarily on the risk of cancer mortality) from exposures of different types of ionizing radiation to different body organs It is calculated by first calculating the dose equivalent to those organs receiving significant exposures, multiplying each organ dose equivalent by a health risk weighting factor, and then summing those products One millirem effective dose equivalent from natural background radiation would have the same health risk as one millirem effective dose equivalent from artificially-produced sources of radiation.

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